

Zero Retries issue 0000 2021-07-09

Introducing Zero Retries

I'm a voracious reader in the service of self-education. If I could merely subscribe to this newsletter, similar to many newsletters and magazines I've voraciously consumed over the years, most of which you've never heard of (Boardwatch, Packet Status Register, Packet Radio Magazine, Micro Cornucopia, SMART Letter, and many others)... I would. But Zero Retries, as I envision it, doesn't exist. (Technically, doesn't exist any longer - I've resurrected the name from the newsletter of the late Northwest Amateur Packet Radio Association - NAPRA). So, as with some things, if you want something to exist, you have to create it yourself. Or, a bit more crudely, sometimes you have to scratch your own itch.

I've been reviving my writing "muscles" for months now on my blogs, and I finally feel ready to begin Zero Retries. Regarding getting started on Zero Retries, however imperfectly, a favorite quote of mine is from the television series Stargate SG-1, "The Serpent's Lair", by Col. Jack O'Neill. The context is that his team is on the cusp of beginning a "big project".:

Well, I suppose now is the time for me to say something profound.

[long pause]

Nothing comes to mind. Let's do it.

Thus, Zero Retries begins.

My Background

This is the current sidebar blurb on my two Amateur Radio blogs, www.n8gnj.org and www.superpacket.org:

Truth be told, to my fellow Amateur Radio Operators, Amateur Packet Radio was my first love. It combined three of my technological passions - radio communications, computers, and data communications. When I moved to the Seattle area in 1987, I fell in with a bad crowd which over the decades has become known as the "WETNET Mafia". That group built a number of Amateur Radio data repeaters (full regeneration) operating at 9600 bps, and operated TCP/IP (concurrent with the opening of the Internet to "civilians").

I've sporadically written about Amateur Radio data communications over the years, including periods of writing for (and very briefly, editing) the TAPR Packet Status Register (PSR) newsletter, and a column in CQ Amateur Radio magazine.

As of 2020, I'm semi-retired and living in Bellingham, Washington and devoting much of my time to exploring "Advanced" Amateur Radio Data Communications.

Survival of Amateur Radio

As a techie who's been interested in all things radio since childhood, I see Amateur Radio in 2021 and beyond having enormous potential. To re-realize that potential, there are four "tricks" that have to be pulled off, nearly simultaneously, in order for that potential to be realized:

1. Amateur Radio has to survive. Yes, that really is a question, because in the minds of regulators, Amateur Radio isn't much more socially relevant than blacksmithing is to modern manufacturing. Amateur Radio uses valuable portions of spectrum, and in many countries, Amateur Radio has only tiny slivers of spectrum (if any at all), and that could also happen in the US.
2. Assuming survival, Amateur Radio regulations have to be modernized to permit much more experimentation, including creating new modes without explicit description in the US Amateur Radio regulations.
3. The public perception of Amateur Radio being a hobby of "old white guys sitting in their basements tapping on a Morse code key" has to be radically improved,
4. Techies, hackers, makers, STEM students have to be made aware that Amateur Radio can be used as an enabling technology for their education, activities, and experiments

The first and second points, Amateur radio's ultimate survival, and Amateur Radio regulations have to be modernized, isn't immediately within Zero Retries' ability to change. That will take a public relations push, followed by capable legal help to push such change through the US FCC. Both will require significant financial resources, which would enable a team of people to effect such changes.

The purpose of Zero Retries is to address the third and fourth. There are a lot of projects and activities going on in Amateur Radio that would be interesting to techies, if only they were aware of them. Looking at the Amateur Radio publications available in 2021, none devote very much, if any, portion of their publication to technical projects or experimentation, and especially on a regular basis.

More favorite quotes (relevant to the survival of Amateur Radio):

"We are surrounded by insurmountable opportunities." - Bill Mollison

"It was the best of times, it was the worst of times." - Charles Dickens

"We have met the enemy, and he is us." - Pogo

"We have them right where they want us." - Captain Kirk

All four of those quotes are apropos to Amateur Radio in 2021. These quotes are touchstones that I will return to and expand upon periodically over the coming months and years here in Zero Retries.

"We are surrounded by insurmountable..."

"... it was the worst of times."

In 2021, Amateur Radio is surrounded by seemingly insurmountable obstacles. To name just one, the widespread perception that Amateur Radio is a quaint relic of the first half of the 20th century, and doesn't really have a place in modern technological society. What is the point of Amateur Radio in the era of a pocket supercomputer wirelessly connected to the worldwide, practically free Internet... occasionally at gigabit speeds?

“... opportunities.”

“It was the best of times...”

Simultaneously with the pessimistic portions of those quotes, Amateur Radio has become empowered by incredible enabling technology such as the Raspberry Pi single board computer, software-defined transceivers such as the Analog Devices ADALM-PLUTO, along with its traditional ability to use many different portions of the radio spectrum, with reasonable transmit power.

Another encouraging sign is despite Amateur Radio's (seemingly) best efforts to market Amateur Radio's potential for self-education in wireless technology (“sushi”) as old white guys sitting in their basement tapping on a Morse Code key (“cold, dead, fish”), we have moments like this:

It's instructive that the largest Volunteer Examiner (VE) Amateur Radio license testing session was at [DEFCON 22 in August 2014](#) (see pages 8 and 9). 205 hackers took their Amateur Radio test at DEFCON 22; the number that passed wasn't noted in the article.

“We have met the enemy, and he is us.”

Amateur Radio operators are often their own worst enemies by resisting change and evolution of Amateur Radio. Just one example is the reluctance of many Amateur Radio operators to embrace a reconfiguration of US Amateur Radio rules to change “specified modes” and especially “maximum data rate” to “maximum occupied bandwidth” to allow greater innovation and experimentation in US Amateur Radio.

“We have them right where they want us.”

Amateur Radio is currently perceived as an “underdog” - weak, disorganized, on its way out, a relic of the 20th century. At least that's the popular perception. But it's within Amateur Radio's ability to change that perception.

A few disclaimers about Zero Retries:

- **US Worldview** - Zero Retries will, of necessity, be written from a US-centric worldview. Zero Retries is written (hopefully, in time, not exclusively) by a US Amateur Radio operator who has little exposure to Amateur Radio outside the US. I'll do my best, and I hope that when I state something categorically, that isn't actually the case outside the US, that helpful readers will help explain the actual facts to me.
- **Technology Centric** - The intended audience of Zero Retries is techies - those that have some exposure, experience, or training with technology. Those who generally understand

how radios, computers, software, networks, and all the other “plumbing” that underlies our 21st century society. In writing Zero Retries, I’ll be speaking to my peers. There’s definitely a need for “getting started” newsletters, etc. and those are out there, but Zero Retries won’t be one of them.

- **Data Centric** - Zero Retries will largely be about data communications in Amateur Radio, but Digital Voice technologies will also be covered. Zero Retries won’t discuss traditional analog systems... or traditional Amateur Radio, much. For example, contests are sometimes useful for proving out new technologies such as a new data mode. The same for finding out the range (DX) of a new data mode. But, generally, Zero Retries will discuss data communications systems, technology, and developments.
- **VHF/UHF Centric** - Make no mistake, there’s ample and continuous development of new data communications modes on Amateur Radio High Frequency (HF) bands. Typically those new HF data communications modes receive reasonable coverage in other publications and venues - even ARRL’s magazine QST. There are so many developments in data modes for VHF / UHF that we’ll scarcely have room to cover them in Zero Retries. Thus, since HF data modes are adequately covered elsewhere, there’s little point in also covering those developments in Zero Retries. (This disclaimer is subject to modification, and I’ll probably wish I hadn’t even mentioned it.)
- **Drinking From a Firehose** - If Zero Retries lives up to a fraction of what I have grown to envision in the decade I’ve been fleshing out the idea, reading a typical issue will feel like trying to take a drink from a firehose at full pressure. There will be more ideas than one can readily absorb. That’s by design. There are so many interesting projects going on that there’s going to be at least something, for everyone, who is technically curious about radio technology. I want Zero Retries to cover many, many projects and become a nexus for at least exposure to those many projects.
- **Not Necessarily Amateur Radio** - There’s a heck of a lot going on in radio experimentation that isn’t Amateur Radio and Zero Retries will occasionally “go out of its Amateur Radio lane” to cover some radio experimentation that’s not Amateur Radio. Just one example is LoRa and LoRaWAN. LoRa operates in license-exempt portions of spectrum such as 433 MHz and 902-928 MHz and provides longer communication range than typical license-exempt systems by implementing Chirp Spread Spectrum (CSS) which results in a robust signal, and a more sensitive receive capability, resulting in longer range. LoRaWAN is the networking of LoRa nodes. While LoRa is a proprietary technology intended for wireless Internet of Things communications (such as irrigation systems in farm fields), Amateur Radio (and radio experimenters) can make good use of LoRa.
- **Open Access... with a dash of Shameless Commerce** - One of my primary “gripes” about the Amateur Radio Publishing-Industrial Complex is that while they publish some good information... it’s all locked away behind paywalls. Subscription magazines are creatures of the 20th century. Thus those entities think they can only exist by keeping their content out of public view, available only to those who pay a regular subscription fee. What’s more useful in 2021? 43 years (1960-2003) of 73 Magazine, every page available on the web (thanks to publisher Wayne Green W1NSD’s gift of his archive of 73 to the Internet Archive to be digitized)? Or having to pay \$49 annually for online

access to QST Magazine (and only viewable via a cumbersome web application to preserve digital rights management)? For a young techie without much money that's curious about Amateur Radio, which is more useful if you're interested in Amateur Radio. With that "young techie without much money" in mind, the full content of Zero Retries will be made publicly available. That said, there will be some kind of "Shameless Commerce Division" beyond the actual content of Zero Retries that will generate some revenue to allow Zero Retries to pay its own way. What form(s) the Zero Retries Shameless Commerce Division will take, is yet to be determined. Some ideas I'll be exploring are:

- Sponsorships (companies)
- Patronage (individuals)
- Advertisements
- Merchandise
- Many other ideas that don't restrict the content of Zero Retries from being freely available.

At the moment, there is no "marketing" for Zero Retries. It will only grow (and gain influence) from those of you that like the content sharing it with your friends and getting them to subscribe.

Amateur Radio SWOT - Minus the SW and T

It's on my list for a future issue of Zero Retries to conduct a Strengths, Weaknesses, Opportunities, and Strengths (SWOT) exercise, from my perspective, for Amateur Radio in 2021 and beyond. In this issue, I'll touch on one primary Opportunity for Amateur Radio - **Amateur Radio Digital Communications (ARDC)**.

***Disclaimer** - As of February, 2021 I am a volunteer member of the Grants Advisory Committee of ARDC. In that role, I do not officially represent ARDC or its positions on any issues. The discussion below about ARDC is my personal opinion, and does not represent the views of ARDC, nor does it disclose any non-public information about ARDC.*

There are two things that might save Amateur Radio. The first is engaging (recruiting, evangelizing) a new type of Amateur Radio Operator who have technical backgrounds and decide to get an Amateur Radio license because it will be useful to them in their technical career (or interest, in the case of makers or STEM students to do so.

The second is the "financial leverage" that ARDC could potentially bring to bear on issues confronting Amateur Radio. Such issues include fundamental research and development for new types of Amateur Radio systems, subsidizing hardware, developing software, public relations for Amateur Radio, regulatory reforms at the FCC, helping new organizations become established, and many other areas where financial resources could make a significant contribution to the overall health of Amateur Radio.

To be clear, ARDC has already made a significant difference in some areas of Amateur Radio. One example is that ARDC has significantly enhanced a number of scholarships awarded by the ARRL (<https://www.ampr.org/grant-american-radio-relay-league-arrl-foundation-scholarships/>). To those scholarship recipients, ARDC has made a profound difference in their ability to attend college. Another example was that ARDC provided the majority of funding to restore the “Big Dish” for W1MX, the MIT Radio Society to the roof of one of the tallest buildings on the MIT campus. The (refreshed) Big Dish will provide unique capabilities for W1MX and a generation of W1MX student members, including “easy” Earth-Moon-Earth, radio astronomy, and many others. (<https://www.ampr.org/grant-mit-radio-society-radome-renewal/>)

Although the majority of the rest of this article was written in 2019, when ARDC was just getting started in its grantmaking, I think the examples here are useful illustrations of the difference that ARDC could make in Amateur Radio. I published a version of the article below in a 2021-03-10 article on SuperPacket.org titled “Amateur Radio Digital Communications (aka ampr.org / 44net)”.

Amateur Radio Digital Communications (ARDC) is a (now) confusing name for a 501(c)3 nonprofit organization whose primary mission is (now) philanthropic grantmaking. ARDC sold a portion of its 44.x.x.x Class A address space for a substantial profit, and invested the proceeds into an endowment. ARDC will continue to manage (and significantly improve) "ampr.org / 44net", which is the infrastructure involved in routing ARDC's remaining allocation of 44net addresses (44.0.0.0/9 and 44.128.0.0/10). With its endowment, ARDC can now make philanthropic grants of significant size and scope. A cumulative list of ARDC's grants to date is at <https://www.ampr.org/grants/>.

Why does the emergence of an “investment fund” that understands Amateur Radio and “next generation” areas such as networking, (new) technology, facilities, etc. matter? I have a few stories to tell that are applicable.

Story 1: ARRL and TAPR DCC Student Paper Program

The first is about student paper presentations at the ARRL and TAPR Digital Communications Conference (DCC) in 1996 and 1997 (PDF). For those two years, a small grant (from the ARRL and TAPR, I think) created a program for university students to submit a paper that was relevant to “electronic communications” (I don’t think the subject was required to be about Amateur Radio, or radio communications, or even digital communications). The program was refereed. Although the DCC was not and is not an academic conference, the student paper program had the same rigor applied as for paper presentations at an academic conference. The papers were refereed by a committee of academics chaired by Greg Jones WD5IVD. The two best papers in each year were awarded a small stipend, and an all-expenses-paid trip to the DCC in 1996 and 1997. From my observations, the program was a success – there were a number of paper submissions, the four winning authors were thrilled to attend the DCC with all expenses paid, and the stipend was a nice bonus. But what was best for the students was that by formally presenting their paper at the DCC, they were able to claim credit on their CV as having presented a paper! That is a major accomplishment for a university student.

But, the program ran only for two years. While I don’t know exactly why the program wasn’t

continued, here's my speculation. After the first two years, Greg Jones (not yet Dr. Jones, if memory serves) couldn't devote the time to managing the committee for a third year, and no one else stepped forward to do so. It takes a lot of time and energy to manage a committee of academics to referee papers for a conference. Second, funding didn't materialize to fund a third year of student paper presentations.

It might be that a small grant from ARDC might have enabled the continuation of the DCC Student Papers Program. The grant could have paid a small stipend to the academic committee to referee the submitted papers, and payment of the student's travel expenses to the DCC to present their papers, and provide the students with a small stipend.

Amateur Radio needs more meaningful experiences like the DCC Student Papers Program, and it's my hope that grants from ARDC can enable more experiences like it.

Story 2: ARISS Next Generation Radio Systems

Amateur Radio on the International Space Station (ARISS) is a tremendous success for Amateur Radio. Likely you've read the stories about the many grade school students who've actually talked, directly over Amateur Radio (usually, but not always) to astronaut Amateur Radio operators onboard the International Space Station (ISS). What you probably don't know is that all of the Amateur Radio equipment onboard the ISS is not furnished by NASA or other country sponsors of the ISS. All Amateur Radio equipment on the ISS has to be furnished at no cost to NASA. That includes development of the equipment, testing, certification, training, and launch costs.

The original Amateur Radio equipment on the ISS, nearly since beginning operations, is old, inadequate, and in some cases, failed. The ARISS funding goal for new Amateur Radio systems is \$150,000, of which only \$33,000 has been raised to date.

ARISS is in critical need of an infrastructure update to ensure that programs like students talking to astronauts in space via amateur radio can continue. Through your donations ARISS seeks the following upgrades:

- Next Generation radio system will support easier radio mode transition, to enable new, exciting capabilities for hams, students and the general public including:
 - New amateur radio communication and experimentation capabilities, including an enhanced voice repeater and updated digital packet radio (APRS) capabilities
 - Slow Scan TV (picture up and downlinks) in both the US and Russian segments of ISS
 - New multi-voltage power supply will support present and future radio capabilities and allow wireless experiments to be conducted
- ARISS needs to build 10 Next Generation Radio Systems to support our development, on-orbit operations, training and long-term maintenance. This includes units on-orbit (2 units--1 unit each in US and Russian segment), flight spares (2 units), training (3 units),

testing (1 unit) and ground-based maintenance & troubleshooting (2 units).

All of that \$150,000 is for actual expenses, not salaries, travel expenses, etc. The range of requirements for ISS hardware is astonishing, such as seamless operation on the US or Russian power systems (totally incompatible with each other), testing that failure of the systems won't cause electrical damage, won't outgas into the ISS atmosphere, maybe even endure vacuum conditions. \$150,000 is a totally reasonable cost, especially when weighed against the vast goodwill that is generated from student contacts with the ISS.

And yet... they're still \$117,000 short – donations of only \$33,000. I certainly don't fault ARISS for that; I've met a few of the ARISS folks at Hamvention, and they're incredibly hardworking. Time spent evangelizing for funds is time that's not spent doing what ARISS is supposed to be about – getting the kids excited about space.

Thus, a grant from ARDC to ARISS to fully fund the ARISS Next Generation Radio Systems would make a huge difference to ARISS, and let them get on with the ARISS mission instead of worrying about fundraising.

Story 3: The Radios That Weren't; Part 1

In 1997, a project was begun under the sponsorship of TAPR to build a Frequency Hopping Spread Spectrum (FHSS) Radio that was designed specifically for use by Amateur Radio operators in the 902-928 MHz band, available to hams in ITU Region 1. This would have been the first radio specifically for Amateur Radio use that employed spread spectrum technology, and it was intended to prove that spread spectrum technology was usable and useful in Amateur Radio. If spread spectrum could work for Amateur Radio in the 902-928 MHz band (which was also a band used for Industrial, Scientific, and Medical [ISM] devices, also known as "Part 15" devices), it could work in the other Amateur Radio VHF/UHF bands.

In 2002, the TAPR FHSS Radio project was discontinued. The reason, in a nutshell, is that radio frequency (RF) design is hard. It's hard enough that those who are good at RF design are always in intensive demand. Despite heroic efforts by the FHSS Radio designers, the project stretched out over several years, long enough that the key components that were in the first design were obsoleted by the manufacturer. So, the team developed a second design for the FHSS Radio using different parts. It happened again! The parts for the second design were obsoleted by the manufacturer!

The problem seemed to be that the development stretched out over several years because the RF development was being done on a part-time basis. If funds had been available to hire a RF engineer that could focus on the design, and complete it within a few months, the design might have been able to be manufactured (at least one or two production runs) before the parts were obsoleted. If that had happened, we might well now be using FHSS or other methods of spread spectrum on Amateur Radio spectrum.

Story 4: The Radios That Weren't; Part 2

A more recent example was the decision by NW Digital Radio in 2018 to formally discontinue their project for a software-defined transceiver for the 440-450 MHz band that they called the UDRX-440.

Disclaimer: I've had a number of private conversations about the UDRX-440 over the past years with some of the principals of NW Digital Radio, and it's not my intent to betray any confidences. Thus, the following description of the UDRX-440 project will be very general.

The genesis of the UDRX-440 was a presentation and a resulting conversation at the 2010 ARRL and TAPR DCC in Vancouver, WA. The UDRX-440 as it came to be called was proposed to be a software-defined transceiver for the Amateur Radio 440-450 MHz band. It would have a 25 watt transmit power, and its emission and reception characteristics would be defined by software. It would incorporate a powerful embedded computer which would manage the radio functions (such as transmit / receive channel), and also provide higher level functions such as data modems, and networking. The design for the UDRX-440 was originally hoped to be a relatively quick design process around an existing RF modem chipset, but that chipset was found to have profound limitations. Like with the TAPR FHSS Radio, the design was restarted using another chipset. From this point, the story of the UDRX-440 is much the same as the FHSS Radio; there just wasn't time, or funds, available to devote focused, full-time effort (both RF hardware and supporting software) into getting the project completed in a reasonable amount of time to push a design into production.

I feel that the UDRX-440 would have been a profound step change in Amateur Radio, likely a larger impact to Amateur Radio than the emergence of the TAPR TNC-2 in 1985. Like the TAPR FHSS Radio, it would have enabled experimentation with spread spectrum techniques (FHSS at a minimum) in the popular 440-450 MHz band. If the UDRX-440 had become a product, it would likely have been followed by versions for the 222-225 MHz band, and likely the 144-148 MHz band. The UDRX's 25 watts provided ample power to form up store-and-forward mesh networks between widely separated Amateur Radio stations to jointly experiment. It would have been able to operate at larger channel sizes such as 100 kHz, adequate to support 56 kbps and faster speeds. It would have enabled more advanced data modes such as incorporating Forward Error Correction (FEC), and much, much more. It was originally going to incorporate a proprietary single board computer running Linux, but with the overwhelming popularity of the Raspberry Pi series of computers use in Amateur Radio, the UDRX-440 was redesigned around the use of a Raspberry Pi.

In short, it was a very promising radio concept for us data geeks in Amateur Radio.

The UDRX-440 was formally discontinued in 2018. To date, there have been no announcements from NW Digital Radio about a successor to the UDRX-440.

Would a grant from ARDC to NW Digital Radio have made a difference in the development of the UDRX-440? And would that have been a good thing, a grant from a 501(c)(3) organization to a for-profit company? Yes, I think it would have made a difference and likely would have resulted in the UDRX-440 becoming a product. ARDC funding could have enabled the hiring of full time, focused RF design as well as hiring of full time, focused software. Consider that NW Digital Radio has demonstrated some history of contributing to open source, so if ARDC made that a requirement of a grant from them (with reasonable provisions for NW Digital Radio to make a profit, say a year of exclusivity before releasing the designs and software as

open source), the Amateur Radio would have benefited from a released product and a “template” for other innovative designs based on the open source template of the UDRX-440.

Those are just four stories of how much difference “enlightened” investment on Amateur Radio projects could make. I am very much looking forward to what ARDC does with its “Angel Fund for Advanced Amateur Radio”.

Updates as of July, 2021:

- Story 1 - I’m pleased by, but take no credit for, ARDC providing a \$10,000 grant in August, 2019 for “Student DCC Attendance Grants” for the 2019 ARRL and TAPR Digital Communications Conference (DCC). For details see <https://www.ampr.org/grants/g2019-08-01a/>. The 2020 DCC was virtual, as will be the 2021 DCC. I hope ARDC will be able to assist students to attend and present at future DCCs.
- Story 2 - I’m pleased by, but take no credit for, ARDC providing a \$110,000 grant in September, 2019 for “ARISS Next Generation Radio”. For details, see <https://www.ampr.org/grants/g2019-09-01a/>. I hope ARDC will continue to fund ARISS development, systems, and activities.
- Stories 3 and 4 - Regarding encouraging new Amateur Radio technology, to date ARDC has provided a number of grants for interesting projects such as a \$50,000 grant in February, 2020 to the GNU Radio Project (<https://www.ampr.org/grants/grant-gnu-radio-project/>), a \$42,500 grant in June, 2020 for “TangerineSDR” (<https://www.ampr.org/grants/grant-tapr-tangerinesdr-prototype-build/>), and a \$250,000 grant in April, 2021 for “M17 Open Protocol” (<https://www.ampr.org/grant-m17-open-protocol/>).
- ARDC grants have enabled the construction of some new or improved Amateur Radio network infrastructure, including a \$100,000 grant in November, 2020 for “San Francisco Wireless Emergency Mesh” (<https://www.ampr.org/grants/grant-sf-emergency-wireless-mesh/>), a €163,400 grant in April, 2021 for “European Radio Network (HAMNET) Support” (<https://www.ampr.org/grant-grantmaking-effort-to-support-radio-network-in-europe/>), and a ~\$89,000 grant in May, 2021 for “Oregon HamWAN Backbone Project 2021” (<https://www.ampr.org/grant-oregon-hamwan-backbone-project-2021/>).

To date, ARDC has awarded many other grants that I didn’t mention above - see <https://www.ampr.org/grants/>. All in all, the grants awarded to date are a good start for ARDC making a significant difference for Amateur Radio.

Closing the Channel

For months, perhaps longer, Zero Retries will remain an experiment in progress. I’ll continue to do the best I can, for as long as I can. If you have ideas, please email me - steve.stroh@gmail.com.

My most profound Thanks go to my loving wife Tina KD7WSF. She's been supportive beyond belief, and without her support, Zero Retries couldn't have happened.

My friend Bill Vodall W7NWP has been my sounding board for Zero Retries and packet experimentation for more than a decade now. I recently named Bill **Zero Retries Instigator In Chief**. Thanks Bill!

My friend Larry Gadallah NM7A has been unfailing encouraging that something like Zero Retries was needed in Amateur Radio. Thanks for keeping the faith, Larry!

I'm indebted to Steve Lamperur KB9MWR as another co-conspirator in imagining a better Amateur Radio future, especially that such a future would be focused on digital. Steve has an excellent blog called **Advancing Ham Radio.. different ideas** at <http://kb9mwr.blogspot.com>. Steve and I have boosted each other over the years about topics of mutual interest. I look forward to meeting him in person sometime soon.

Lastly, I'm profoundly grateful to Greg Jones WD5IVD (SK). When he was President of TAPR, Greg encouraged me - "Yes, you should write about this stuff!" My articles for TAPR's Packet Status Register newsletter were the writing samples that I submitted for the assignment that ended up launching my professional writing career.

Thanks for reading!

Steve Stroh N8GNJ
Bellingham, Washington, USA
2021-07-09

Below is a much more complete "footer" that has evolved over 30+ issues of ZR.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, here are some pointers:

- **Ham Radio for Dummies** by Ward Silver N0AX is a great overview of Amateur Radio. N0AX is a gifted writer and HRFD is now in its [4th edition](#).
- My two favorite **YouTube** channels for a good overview of Amateur Radio are [AmateurLogic.TV](#). and [Ham Nation](#) (part of Ham Radio Crash Course). These folks just seem to have so much fun!
- [Radio Amateur Training Planning and Activities Committee \(RATPAC\)](#) offers weekly presentations on general Amateur Radio topics (Wednesdays) and emergency communications in Amateur Radio (Thursdays).
- Dan Romanchik KB6NU offers a free **No-Nonsense Study Guide** for the [Technician test](#) (PDF).

- [HamExam.org Amateur Radio Practice Exams](#) offers good **Flash Card and Practice Exams**.
- When you're ready to take an **Amateur Radio examination** (Tech, General, or Extra), W1MX - The MIT Amateur Radio Society offers [remote exams](#), free for students and youngsters. *There are apparently [many other remote exam options](#).*

Bonus - with an Amateur Radio license, you'll be [more attractive on dates](#) 😊

Closing the Channel

- In its mission to grow Amateur Radio and make it more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to anyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex!
- My ongoing Thanks to Tina Stroh KD7WSF for, well, *everything* and Bill Vodall W7NWP as *Zero Retries Instigator in Chief*.
- My ongoing Thanks to pseudostaffers [Dan Romanchik KB6NU](#) and [Jeff Davis KE9V](#) for continuing to spot, and write about “Zero Retries Interesting” type items, on their respective blogs, from Amateur Radio and beyond, that I don't spot on my own.
- [Southgate Amateur Radio News](#) consistently surfaces “Zero Retries Interesting” stories.
- The [Substack email publishing platform](#) makes Zero Retries possible. I recommend it for publishing newsletters.

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Email issues of Zero Retries are “instrumented” by [Substack](#) to gather basic statistics about opens, clicking links, etc. I don’t use such information in any way other than seeing that most subscribers actually do read Zero Retries.

All previous issues of Zero Retries are available without restriction (no paywalls). For some background, Zero Retries 0000 was the **Introduction Issue**. Zero Retries 0026 and Zero Retries 0027 were a **2021 Year End Review** of Zero Retries.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) - *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) - *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs - Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ (He / Him)

These bits were handcrafted in beautiful Bellingham, Washington, USA

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Update - Minor formatting changes were made 2023-04-06; no content was changed.